Convective Severe Weather

2b. Given appropriate data, construct a forecast sounding with at least 75% accuracy based on a master solution. One instructor assist is allowed.

Developing a forecast sounding

- Most useful where RAOB file time don't coincide with max heating, or when frontal passage will be changing your air mass.
- To develop a forecast sounding you must first forecast temperature and dew point for specific mandatory pressure level at a predetermined time.

Developing a forecast sounding

- At the surface level:
  - Forecast the temperature for the predetermined time
  - Using the LAWC, advect the analyzed isodrosotherm (i.e., surface dew-point temperature) with the low-level flow.
  - Then plot the forecast temperature and dewpoint temperature on the forecast sounding.

Developing a forecast sounding

- At the 850-mb level:
  - Forecast and plot a temperature for the time period based on the advection of the upstream air.
  - To forecast an 850-mb dew-point temperature, consider adiabatic effects as well as horizontal advection
    - a Forecast 850-mb dew point based on advection
    - b Find and record the saturation mixing ratio value
    - c Forecast and record the mixing ratio equivalent to the surface dew-point

Developing a forecast sounding

- d Average the mixing ratio values for both the surface and 850-mb levels
- e Plot the value from step 4 above, this is the forecast 850-mb dew-point temperature.

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Developing a forecast sounding

- At the 700-mb level:
  - Forecasting the 700-mb temperature and dew point based on the advection of upstream air.
  - Then plot the values.
  - Dry air at 700 mb supports severe thunderstorm development.

Developing a forecast sounding

- At the 500-mb level:
  - Forecasting the 500-mb temperature and dew point based on the advection of upstream air.
  - Forecast intensity changes in the synoptic systems and the changes that will occur with the thermal patterns.
- Then plot these values on the forecast sounding.
- At this point, the forecast sounding can be constructed.

Developing a forecast sounding

- The stability indices that do not utilize vertical wind shear can be calculated at this time.

Vertical wind shear

- For severe storm development, vertical wind shear is virtually important.
- Veering of 40-90° between the 850 mb and the 500-mb levels is favorable for destabilization.

Vertical wind shear

- Therefore, winds are forecast for these levels only.
  - At 850 mb, forecast wind direction and speed.
  - Then plot on the forecast sounding.
  - You may use any of the following to determine the wind:
    - Advect the wind from an upstream station,
    - The geostrophic wind and vorticity chart, and/or
    - The contour/flow pattern and estimate the wind.

Vertical wind shear

- At 500mb forecast wind direction and speed.
- Then plot on the forecast sounding.
- You may use any of the following to determine the wind:
  - Advect the wind from an upstream location, then make any necessary intensity changes, or
  - An initialized NGM/Eta would be a good "first guess" for the wind direction at 500 mb.
- The forecast sounding is now complete.

Vertical wind shear

- You have a picture of what the atmosphere will look like for a specific time period.
- The forecast air mass can be evaluated and potential for changes in the weather pattern can be identified.

- APPLICATION: Students will practice forecasting on appraisal packages in class
- EVALUATION: A written measurement and progress check will be given at the end of the unit.